Fishery Management Report No. 07-29

The 2006 Spiridon Lake Sockeye Salmon Stocking Project and Related Monitoring Parameters

by

Steve Schrof

April 2007

Alaska Department of Fish and Game Divisions of Sport Fish and Commercial Fisheries

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY MANAGEMENT REPORT NO. 07-29

THE 2006 SPIRIDON LAKE SOCKEYE SALMON STOCKING PROJECT AND RELATED MONITORING PARAMETERS

by

Steve Schrof
Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

April 2007

The Kodiak Regional Aquaculture Association (KRAA) funds the general operations of the Spiridon Lake sockeye salmon stocking project and Pillar Creek Hatchery. The Division of Commercial Fisheries provides biological oversight and evaluation in the management of returning adult runs to the enhanced or rehabilitated systems associated with hatchery stocking projects.

The Division of Sport Fish Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Since 2004, the Division of Commercial Fisheries has also used the Fishery Management Report series. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm. This publication has undergone regional peer review.

Steve Schrof
Alaska Department of Fish and Game, Division of Commercial Fisheries,
211 Mission Road, Kodiak, Alaska 99615 USA

This document should be cited as:
Schrof, S. 2007. The 2006 Spiridon Lake sockeye salmon stocking project and related monitoring parameters. Alaska Department of Fish and Game, Fishery Management Report No. 07-29, Anchorage.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

A sockeye salmon *Oncorhynchus nerka* enhancement stocking project was initiated at Spiridon Lake in the early 1990s to provide increased harvest opportunities for fishermen in the Kodiak Management Area. Because Spiridon Lake lies within the boundaries of the Kodiak National Wildlife Refuge (KNWR), the Spiridon Lake Management Plan (SLMP) requires that ADF&G monitor and examine water quality and zooplankton parameters, the smolt outmigration and juvenile stocking numbers, and the commercial salmon harvest to ensure the project remains compatible with the KNWR mission.

In 2006, Spiridon Lake had a 468:1 ratio for total nitrogen to total phosphorus, total ammonia level of 7.1 μg/L, and a chlorophyll *a* concentration of 0.75 μg/L. The zooplankton community had a *Diaptomus* to *Cyclops* ratio of 0.07:1, a copepod biomass of 0.9 mg/m^3, a *Bosmina* to *Daphnia* ratio of 0.92:1, a cladoceran biomass of 5.1 mg/m^3, and a *Bosmina* size (average length) of 0.47 mm. An estimated 564,959 sockeye salmon smolt emigrated from Spiridon Lake in the spring of 2006 while a total of 3,196,512 sockeye salmon juveniles were stocked in the summer and fall. A total of 36,467 adult sockeye salmon were harvested in the Spiridon Bay Special Harvest Area (SBSHA) and reported on commercial fish harvest tickets.

Some of the data collected in 2006 to monitor the Spiridon Lake stocking project were not within the ranges specified in the SLMP. In an effort to keep the Spiridon Lake enhancement project compatible with the SLMP guidelines, projected stocking levels for 2007 are being lowered by almost 50% from the previous years' (2006) stocking level to reduce the grazing pressure on the zooplankton community by juvenile sockeye salmon.

Key words: Spiridon Lake, Telrod Cove, Special Harvest Area, *Oncorhynchus nerka*, sockeye salmon, stocking, Kodiak National Wildlife Refuge, U.S. Fish and Wildlife Service, Kodiak Regional Aquaculture Association, Special Use Permit, limnology, zooplankton.

INTRODUCTION

This report consolidates the 2006 and historical data collected as part of the Spiridon Lake sockeye salmon *Oncorhynchus nerka* enhancement project. Spiridon Lake is located within the boundaries of the Kodiak National Wildlife Refuge (KNWR); therefore, the stocking project is subject to U.S. Fish and Wildlife Service (USFWS) and KNWR guiding principles and conditions. Such principles and conditions are described in the Spiridon Lake Management Plan (SLMP; Chatto 2000) and the project is permitted under the Spiridon Lake Special Use Permit (SLSUP). This report fulfills the reporting requirements as outlined in the SLMP and SLSUP.

Spiridon Lake does not support an anadromous fish run due to a series of falls that prevents lake access to migrating salmonids. A stocking project was initiated to utilize the lake's freshwater rearing environment without upsetting the nutrient balance or forage base (macrozooplankton) of the lake (Honnold 1997). In addition to the utilization of the lakes forage, stocking a barren lake also provides researchers and managers with the opportunity to thoroughly assess the response of the macrozooplankton community to predation by juvenile salmon while reducing possible interactions with wild stocks by directly harvesting adults in a specified (terminal) area (Kyle 1996).

In 1990, Alaska Department of Fish and Game (ADF&G) in cooperation with Kodiak Regional Aquaculture Association (KRAA) submitted proposals to the USFWS to stock sockeye salmon into Spiridon Lake in the Kodiak Unit of the KNWR (Chatto 2000). The KNWR prepared an environmental assessment (EA) for the proposed project, which resulted in a finding of no significant impact. The KNWR issued a temporary five-year Special Use Permit (SUP) for the Spiridon Lake project to the ADF&G. The SUP was intended to allow the stocking project to be thoroughly evaluated and additional baseline data to be collected. In 1997, ADF&G consolidated existing information (excluding wildlife studies) from the Spiridon Lake stocking project into one document (Honnold 1997), which was then used for reference in writing the existing KNWR

SLMP (Chatto 2000). The SLMP was authorized in June 2000 with a 5-year renewable SLSUP to continue stocking and monitoring in the KNWR. Juvenile sockeye salmon have been stocked into Spiridon Lake annually since 1990 (Schrof and Honnold 2003). Since 1991, ADF&G has annually enumerated the smolt migrating out of Spiridon Lake and collected samples for age, size, and condition data. The returning adult sockeye salmon have been harvested in the Spiridon Bay Special Harvest Area since 1994 (SBSHA; Figure 1). ADF&G has annually monitored the fishery and sampled a portion of the sockeye salmon commercial catch for age, sex, and length data.

This report summarizes the 2006 results and historical monitoring data and compares them to the SLMP guidelines.

MANAGEMENT PLAN MONITORING GUIDELINES

The purpose of the SLMP is to document the various components of the lake stocking project, to outline how the project will be managed to remain compatible with the KNWRs mission, and to serve as a reference document to guide any proposed changes to project operations (Chatto 2000).

Monitoring guidelines were established from data collected at Spiridon Lake from 1987 to 1999. Criteria for specific limnological and fishery parameters were developed for comparison purposes. If measurements were outside the criteria specified in the Management Plan for any given parameter for two or more consecutive years, then the stocking project may need to be adjusted to meet the guidelines and purposes of the KNWR (Chatto 2000). Specific parameters monitored include lake nutrient concentrations (nitrogen, phosphorus, total ammonia, and chlorophyll *a*), zooplankton composition, density, and biomass, smolt production, and adult harvest estimates (Table 1).

DESCRIPTION OF STUDY AREA

Spiridon Lake (57° 40’ N lat., 153° 39’ W long.) is located on the northwest side of Kodiak Island, approximately 74 km southwest of the City of Kodiak (Figure 1). The lake is 9.6 km long, up to 1.6 km wide, and has a surface area of 9.2 km^2 (Figure 2; Schrof and Honnold 2003). Spiridon Lake is at an elevation of 136 m, has a mean depth of 34.7 m, and a maximum depth of 82.0 m. The Spiridon Lake outlet stream (Telrod Creek) is approximately 2.0 km long and empties into Telrod Cove. Telrod Creek has three waterfalls that are impassable to anadromous fish. Two waterfalls are located approximately 0.8 km downstream of the lake outlet, and a third waterfall, located near the stream terminus, blocks salmon from migrating further upstream.

Resident fish in Spiridon Lake include: rainbow trout *O. mykiss,* Dolly Varden char *Salvenlinus malma,* threespine stickleback *Gasterosteus aculeatus,* and freshwater sculpin *Cottus aleuticus* (Honnold 1997).

METHODS

LAKE LIMNOLOGY MONITORING

The SLMP outlines a range of values and parameters for specific water quality and biological characteristics that are used as guidelines to ensure that the Spiridon Lake sockeye salmon stocking project remains compatible with KNWR objectives (Chatto 2000). Parameters specified in the SLMP included total nitrogen (TN) to total phosphorus (TP) ratio, total ammonia (TA), chlorophyll *a* (Chl *a*), *Diaptomus* to *Cyclops* density ratio, copepod biomass, *Bosmina* to *Daphnia* density ratio, cladoceran biomass, and cladoceran (*Bosmina*) average size.

Lake Sampling Protocol

To obtain the limnology data, ADF&G personnel traveled to Spiridon Lake in a fixed-wing aircraft five times from May to September at approximately four-week intervals. Two sampling stations were established in the deepest basins of the lake using Global Positioning Satellite (GPS) equipment (Figure 1). Water samples were collected from the 1 m and 50 m depths and a 50 m vertical tow was hauled to collect zooplankton. Samples were collected following standard ADF&G sampling procedures from (Koenings et al. 1987).

Water samples for general chemistry and nutrient analysis were collected from the epilimnion during each survey at 1 m below the water surface. Samples were collected using a 4-liter Van Dorn sampler, and the samples were emptied into separate, pre-cleaned polyethylene (poly) carboys, which were kept cool and dark in the float of the plane until processed at the laboratory in Kodiak. Vertical zooplankton hauls were made at each station using a 0.2 m diameter conical net with 153 μm mesh. The net was pulled manually at a constant speed (~0.5 m sec^{-1}) from approximately 50 m to the lake surface. The contents from each tow were emptied into a 125 ml poly bottle and preserved in 10% neutralized formalin.

General Water Chemistry and Nutrients

Unfiltered water was analyzed for total phosphorus (TP), total Kjeldahl nitrogen (TKN), pH, and alkalinity. Sample water was filtered through a rinsed 4.25 cm diameter Whatman GF/F cellulose fiber filter and stored frozen in phosphate free soap-washed poly bottles. Filtered water was also analyzed for total filterable phoshorus (TFP), filterable reactive phosphorus (FRP), nitrate + nitrite (NO_3^- + NO_2^-), ammonium (NH^{4+}), and reactive silicon.

TP, TFP, and FRP were analyzed using a Spectronic Genesys 5 Spectrophotometer (SGS) using the potassium persulfate-sulfuric acid digestion method described in Koenings et al. (1987) and adapted from methods in Eisenreich et al. (1975). Unfiltered frozen water was sent to South Dakota University for the TKN analysis. Total ammonia was converted to ammonia (NH_3) and reacted to phenol and sodium hypochlorite and analyzed with the SGS. The pH of water samples was measured with a Corning 430 meter, while alkalinity (mg L^{-1} as $CaCO_3$) was determined from 100 ml of unfiltered water titrated with 0.02 N H_2SO_4 to a pH of 4.5. Reactive silicon was determined with a SG5 spectrophotometer using the ammonium molybdate – sodium sulfite method described in Koenings et al. (1987) and ADF&G (2002).

Water samples were passed through columns by using the cadmium reduction method described by Koenings et al. (1987) and further analyzed colorimetrically with the SGS to determine nitrate + nitrite (NO_3^- + NO_2^-) concentrations in the lake. Total nitrogen (TN), the sum of TKN and nitrate + nitrite, and the total nitrogen to total phosphorus ratio were calculated from the station 1 samples in 2006.

Chlorophyll *a*

For chl *a* analysis, 1.0 L of water from each sample was filtered through a Whatman GF/F filter under 15 pounds per square inch of vacuum pressure. Towards the end of the filtration process, approximately 5 ml of magnesium chloride ($MgCO_3$) was added to the final 50 ml of water to preserve the sample. Filters were stored frozen and in individual plexiglass slides until analyzed. Filters were then ground in 90% buffered acetone using a mortar and pestle, and the resulting slurry was refrigerated in separate 15 ml glass centrifuge tubes for 4 hours to ensure maximum pigment extraction. Pigment extracts were centrifuged, decanted, and diluted to 15 ml with 90% acetone (Koenings et al. 1987). The extracts were analyzed using the SGS using methods described by Thomsen (ADF&G 2002).

Zooplankton

For zooplankton analysis, cladocerans and copepods were identified according to taxonomic keys in Edmondson (1959). Zooplankton were measured in triplicate 1 ml subsamples taken with a Hansen-Stempel pipette and placed in a Sedgewick-Rafter counting chamber. Lengths from a minimum of 15 animals of each species or group (typically animals are grouped at the genus level) were measured to the nearest 0.01 mm, and the mean was calculated. Biomass was estimated from species-specific linear regression equations between length and dry weight derived by Koenings et al. (1987). Zooplankton data from the two stations were averaged for each survey date.

STOCKING

Stocking densities for Spiridon Lake were determined by estimating the lake's rearing capacity based on in-season zooplankton biomass from May through July (Schrof and Byrne 2006). Saltery Lake sockeye salmon eggs were collected in early September of 2005 by Pillar Creek Hatchery (PCH) personnel using standard fish culture procedures (ADF&G 1994). Eggs were flown back to Kodiak, incubated and reared at PCH, and the juvenile salmon were then aerially released into Spiridon Lake via fixed-wing aircraft.

SMOLT MONITORING

Two technicians monitored, estimated, and sampled the sockeye salmon smolt emigration from Spiridon Lake (Figure 2). Sockeye salmon smolt that emigrated from the lake were funneled into a counting tank, enumerated, and released into a bypass system that circumvented the barrier falls. The entire bypass system consisting of two Canadian fan traps and supporting frame work, de-watering tanks, troughs, and a diversion weir (Chatto 2000; Foster et al. 2006) were installed in the Spiridon Lake outlet creek (Telrod Creek). A 15 cm diameter black poly pipeline provided smolt passage around the falls carrying water and smolt approximately 0.75 km, dropping about 90 m in elevation where the pipeline terminated and smolt exited into lower Telrod Creek. Timed counts were used, as in past years, to estimate the number of emigrating smolt (Foster et al. 2006). Forty smolt were sampled five days a week for age and size data (Foster et al. 2006). Once smolt emigration ceased, the bypass system was removed from the creek and stored on the stream banks.

HARVEST MONITORING

Harvest within the SBSHA was monitored by two ADF&G personnel stationed at a camp on the outer eastern shoreline of Telrod Cove (Figure 1; Chatto 2000). In 2006, the camp was operated from late June to early August.

Monitoring activities included: assessing sockeye salmon run strength, recording the fishing effort, estimating the commercial catch by species, and sampling a portion of the sockeye salmon catch for age, sex, and length data (Foster et al. 2006; Schrof and Honnold 2003). The ADF&G fish ticket database was used to generate the end-of-season catch summaries and to confirm on-site estimates.

ESCAPEMENT MONITORING

The field crew conducted a foot survey of Telrod Creek during the commercial fishery to estimate sockeye salmon and pink salmon *O. gorbuscha* escapements. Live and dead salmon were enumerated by species. In an effort to monitor the chum salmon escapements of surrounding systems, aerial surveys of the Spiridon River drainage and Spiridon Bay were conducted in August with fixed-wing aircraft by ADF&G biologists.

RESULTS AND DISCUSSION

LAKE LIMNOLOGY MONITORING

Total Nitrogen to Total Phosphorus Ratio

The total nitrogen to total phosphorus ratio (TN:TP) in Spiridon Lake was 468:1 in 2006 (Table 2), which was above the desired range of 148:1 to 273:1, specified in the SLMP (Table 1). The 2006 TN:TP ratio was the highest recorded at Spiridon Lake. The 2005 TN:TP ratio (296:1) was the highest ratio recorded prior to 2006 (Table 2). In contrast, the 2003 TN:TP ratio of 118:1 and the 2004 TN:TP ratio of 130:1 were the two lowest ratios recorded. High TKN levels coupled with a much lower TP level resulted in higher TN:TP ratios for the past two years (2005-2006).

Total Ammonia

The 2006 seasonal mean concentration for total ammonia levels was 7.1 $\mu g\ L^{-1}$ at 1 m in Spiridon Lake (Table 3). There was little variability observed between sampling dates. The 2006 seasonal ammonia concentration was higher than the average concentration (4.9 $\mu g\ L^{-1}$) during the years (1990-2005) of stocking at the 1 m depth, but was still within the range of 1.6 - 11.2 $\mu g\ L^{-1}$ specified in the SLMP (Table 1).

Chlorophyll *a*

Chl *a* levels in Spiridon Lake averaged 0.75 $\mu g\ L^{-1}$ at the 1 m depth in 2006. The chl *a* level was averaged from water samples collected at two stations in the lake (Table 3). The average Chl *a* concentration was within the specified range of 0.1 - 1.0 $\mu g\ L^{-1}$ (Table 1). Chl *a* concentrations showed some seasonal variability and the seasonal average was slightly higher than the historical 1990 to 2005 mean of 0.52 $\mu g\ L^{-1}$ (SD = 0.22).

Total Zooplankton

The SLMP includes specific criteria to assess the lake's zooplankton (Table 1). In addition to the SLMP criteria, total biomass, density, and the cladoceran to copepod ratio are reported (Table 4). The 2006 seasonal mean zooplankton density in Spiridon Lake was 1,785 No./m^3 and the biomass was 5.2 mg/m^3 (Table 4; Figure 3). Zooplankton density and biomass in 2006 were the lowest mean values measured since the inception of zooplankton sampling in 1987 at Spiridon Lake. The majority of the zooplankton in Spiridon Lake in 2006 were cladocerans, and the cladoceran to copepod ratio was the highest recorded. In the previous decade (1990-2000), the cladoceran to copepod biomass ratio was consistently less than 1:1 except for the 1997 ratio of 1.06:1. From 2001 through 2005, the annual copepod biomass has been lower than the cladoceran biomass resulting in a ratio above 1:1.

Diaptomus to Cyclops Density Ratio

The *Diaptomus* to *Cyclops* density ratio was 0.07:1, which met the criteria range (0.01 – 0.54) specified in the SLMP (Table 5; Table 1). The average ratio from 1990-2005 was 0.11:1. Although the ratio of *Diaptomus* to *Cyclops* has been low in most years since 1992, it has met the specified criteria in all years.

Copepod Biomass

The average number of copepods in Spiridon Lake in 2006 was 279 No./m^3 and the average biomass was 0.9 mg/m^3, which was outside of the SLMP criteria range of 3.5 – 21.7 mg/m^3 (Table 5; Table 1). The average copepod density from 1990-2005 was 4,859 No./m^3 and the average biomass was 10.3 mg/m^3. In the recent three years of zooplankton monitoring (2004-2006), copepod biomass estimates have been at their lowest levels. *Cyclops* continues to be the dominant copepod in Spiridon Lake.

Bosmina to Daphnia Density Ratio

The *Bosmina* to *Daphnia* density ratio of 0.92:1 was within the criteria range (0.22 – 1.73:1) specified in the SLMP (Table 6; Table 1). The average ratio from 1990-2005 was 1.07:1.

Cladoceran Biomass

The seasonal average of cladocerans in Spiridon Lake was 1,453 No./m^3 with an average biomass of 5.1 mg/m^3, which was within the SLMP criteria range of 2.6 – 6.8 mg/m^3 (Table 1 and 6). The average biomass (5.1 mg/m^3) in 2006 was slightly below the historical average cladoceran biomass of 5.8 mg/m^3 (1990-2005; Table 6).

Cladoceran (Bosmina) Size

The cladoceran *Bosmina* averaged 0.47 mm in length, which was below the criteria (≥ 0.51 mm) specified in the SLMP (Table 7; Table 1). The average size of *Bosmina* from 1990-2005 was 0.53 mm and the average size prior to the first stocking in 1990 was 0.58 mm. The rationale for the minimal size requirement for *Bosmina* is that this species will decrease its reproductive size under increased predation pressure. As sockeye salmon grow, they tend to target larger zooplankton to increase their efficiency of energy transfer (Kyle 1992). In addition, the stocking strategy was to release larger juvenile sockeye salmon later in the season (fall) to reduce grazing pressure. However, the 2006 release of approximately 3.2 million juvenile sockeye salmon into Spiridon Lake impacted not only the larger zooplankton, but also the smaller cladoceran *Bosmina*. Even though the average size of *Bosmina* was below the SLMP threshold, the *Bosmina* in Spiridon Lake were still larger than the minimum elective feeding threshold of 0.40 mm for juvenile sockeye salmon (Kyle 1992).

STOCKING

Juvenile sockeye salmon were stocked at different life stages into Spiridon Lake on two occasions in 2006. On June 23-24, approximately 2,765,088 fry (average 0.37 g) were stocked into Spiridon Lake and on October 5-6, approximately 431,424 pre-smolt (average 9.90 g) were stocked, for a total of 3,196,512 juveniles (Table 8). The 2006 release was the highest annual release since 2000, and was slightly lower than the historical average of 3,407,762 sockeye salmon stocked into Spiridon Lake from 1991 to 2005.

SMOLT MONITORING

Approximately 564,959 live sockeye salmon smolt emigrated from Spiridon Lake in 2006 (Table 9). The average emigration from 1992 to 2005 was 877,260 smolt. Smolt mortality occurring in the trapping/bypass system was considered minimal at 0.2% in 2006.

The age composition of the 2006 outmigration was predominately age-1. (83.2%) and the remaining smolt emigrating were age-2. (16.8%; Table 9). The 14-year average (1992-2005) age composition of Spiridon Lake sockeye salmon smolt was 79.7% age-1., followed by 20.1% age-2 and 0.2% age-3. smolt.

Age-1. smolt averaged 107 mm in length and weighed 9.7 g in 2006 (Table 10). Age-2. smolt averaged 158 mm and weighed 32.6 g. Average size of age 1. smolt in 2006 were almost the same size as 2005 smolt and consistent with the historical size of smolt from Spiridon Lake (Table 10).

HARVEST MONITORING

Commercial salmon harvests in the SBSHA occurred from June 28 through August 12 in 2006 (Table 11). Approximately 36,467 sockeye salmon, 7 coho salmon *O. kisutch*, 29,281 pink salmon, and 1,099 chum salmon *O. keta* were harvested. The 2006 harvest of the target species, sockeye salmon, was the second smallest harvest in the 13-year history of the special harvest area (Table 12). The number of non-targeted salmon species was notably less than in most years. The 2006 harvest of pink salmon was the second lowest harvest after 2004 (23,644). Incidental pink salmon harvests are expected to remain low because of earlier closures to the SBSHA. The success of this management strategy was apparent by the lack of coho salmon harvested in the SBSHA in the last few years (2003-2006).

Age-1.2 sockeye salmon comprised the majority (83.0%) of the harvest in 2006, while the age-1.3 fish comprised 11.9% of the harvest (Table 13). Historically (1994-2005), the age-1.2 component has represented slightly more than half of the Telrod Cove harvest (57.3%), while the age-1.3 component has represented 21.1% of the harvest and age-2.2 comprised 16.3%.

ESCAPEMENT MONITORING

A stream survey of Telrod Creek was conducted downstream of the terminal falls on July 30, 2006. A total of 500 sockeye salmon and no pink salmon were observed (Table 14). Stream surveys are conducted in Telrod Creek to determine the number of sockeye salmon escaping the commercial fishery and to estimate the pink salmon escapement into the creek specified in the SLMP. We did not observe any pink salmon because the survey was limited to observing fish activity at the plunge pool at the bottom of the barrier fall. Pink salmon do not typically reach the plunge pool due to barriers downstream blocking their migration. Also, the run timing for pink salmon escaping into Telrod Creek is later; typically pink salmon enter Telrod Creek from approximately mid-August to mid-September. No surveys were conducted after August 1 because the Telrod Cove camp was closed.

The indexed peak pink salmon escapement count into the Spiridon River (stream #254-401) was estimated to be 14,700 on August 17 (Table 15). An indexed peak chum salmon escapement count of 5,000 was estimated on a second survey (August 26). No coho salmon were observed in either of the surveys, which can be expected considering the later run timing of coho salmon to the system. Indexed aerial salmon escapements of the Spiridon River are always difficult due to the heavily glaciated and turbid water conditions. These estimates were considered very conservative and may not truly reflect the total abundance in the Spiridon River drainage. The commercial fishery in the SBSHA was closed on August 18, resulting in few non-targeted species harvested in 2006. Using the Saltery Lake sockeye salmon brood stock for the Spiridon Lake enhancement project (earlier run timing) will continue to reduce the exploitation of pink and coho salmon bound for Spiridon River.

OUTLOOK FOR 2007

With the decline in the lakes zooplankton density and biomass in 2006, a reduction in the projected release of juvenile sockeye salmon into Spiridon Lake is planned for 2007. Scheduled releases are 1.5 million fry and 250 thousand pre-smolt for a total projected release of 1.75 million juvenile sockeye salmon into Spiridon Lake.

The activities for the Spiridon Lake project at the smolt site (Telrod Creek) are expected to be status quo for the 2007 field season. For the adult monitoring portion, there will be a reduction in the tasks for the crew stationed at Telrod Cove in 2007. Specifically, the ADF&G will not conduct foot surveys of Telrod Creek to estimate pink salmon escapements. These surveys of Telrod Creek were necessary when the late-run Upper Station sockeye salmon run timing (mid-August to early September) coincided with pink salmon returns to Telrod Creek. However, with the change to the earlier run timing sockeye salmon stock (mid-July) as a brood source, the commercial fishery will be closed in Telrod Cove around the time when the peak of the pink salmon returns to Telrod Creek are expected. The commercial fishery in Telrod Cove should have no impact on the pink salmon escaping to Telrod Creek. The reduction of foot surveys to estimate the pink salmon escapement into Telrod Creek was reported in the updated SLMP (Schrof 2005) when the 5-year renewal of the SUP for the Spiridon Lake enhancement project was approved in January, 2006.

REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 1994. Alaska sockeye salmon culture manual. Special Fisheries Report No. 6. Juneau.

ADF&G (Alaska Department of Fish and Game). 2002. Kodiak Lake Assessment/Limnology Project Laboratory Analysis Operational Plan. [*In*]: Salmon research operational plans for the Kodiak and Alaska Peninsula areas, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K02-36, Kodiak.

Chatto, D. T. 2000. Spiridon Lake enhancement project management plan. US Fish and Wildlife Service, Kodiak National Wildlife Refuge, Kodiak.

Eisenreich, S. J., R. T. Bannerman, and D.E. Armstrong. 1975. A simplified phosphorous analysis technique. Environ. Letters 9:43-53.

Edmondson, W. T. 1959. Fresh-water biology, *second edition*. John Wiley and Sons, New York.

Foster M. B., S. Duesterloh, S. Thomsen, R.T. Baer, G. Watchers, and S. Schrof. 2006. Salmon research operational plans for the Kodiak area, 2006. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K06-4, Kodiak.

Honnold, S. G. 1997. The results of sockeye salmon *Oncorhynchus nerka* stocking into Spiridon Lake on the Kodiak National Wildlife Refuge: juvenile and adult production, commercial harvest, and ecosystem effects, 1987-1999. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K01-32, Kodiak.

Koenings, J. P., J. A. Edmundson, G. B. Kyle, and J. M. Edmundson. 1987. Limnology field and laboratory manual: methods for assessing aquatic production. Alaska Department of Fish and Game, FRED Division Report Series 71, Juneau.

Kyle, G. B. 1992. Assessment of lacustrine productivity relative to juvenile sockeye salmon *Oncorhynchus nerka* production in Chignik and Black Lakes: Results from 1991 surveys. Alaska Department of Fish and Game, Fisheries Rehabilitation, Enhancement, and Development Division Report No. 119.

Kyle, G. B. 1996. Stocking sockeye salmon *Oncorhynchus nerka* in barren lakes of Alaska: effects on the macrozooplankton community. Fisheries Research 28:29-44.

Schrof, S. 2005. Spiridon Lake sockeye salmon enhancement project monitoring plan. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K05-5, Kodiak.

REFERENCES CITED

Schrof, S. and G. Byrne. 2006. Pillar Creek Hatchery annual management plan, 2006. Alaska Department of Fish and Game, Division of Commercial Fisheries, Fishery Management Report No. 06-46, Kodiak.

Schrof, S. T. and S. G. Honnold. 2003. Salmon enhancement, rehabilitation, evaluation, and monitoring efforts conducted in the Kodiak Management Area through 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K03-41, Kodiak.

TABLES AND FIGURES

Table 1.-Spiridon Lake limnological and fishery monitoring parameters specified in the Spiridon Lake Management Plan (SLMP), and the 2006 results.

Parameter	Range Specified in the SLMP	2006 results
Lake Limnology Monitoring		
Total Nitrogen : Total Phosphorous Molar Ratio	148 - 273	468
Total Ammonia (μg/ L)	1.6 - 11.2	7.1
Chlorophyll *a* (Chl *a*) (μg/L)	0.1 - 1.0	0.75
Diaptomus : *Cyclops* Density Ratio	0.01 - 0.54	0.07
Copepod Biomass (mg/m^3)	3.5 - 21.7	0.9
Bosmina : *Daphnia* Density Ratio	0.22 - 1.73	0.92
Cladoceran Biomass (mg/m^3)	2.6 - 6.8	5.1
Cladoceran (*Bosmina*) average size (mm)	$\geq$ 0.51	0.47
Stocking		
Sockeye		3,196,512
Smolt Monitoring		
Sockeye smolt outmigration estimate		564,959
Harvest Monitoring		
Telrod Cove (254-50)		
Sockeye		36,467
Coho		7
Pink		29,281
Chum		1,099
Escapement Monitoring		
Telrod Creek (254-403)		
Sockeye		500
Pink	>200	0
Spiridon River (254-401)		
Pink	15,000-45,000	14,700
Chum	10,000-30,000	5,000
Coho	4,000-12,000	

Table 2.-Seasonal mean total kjeldahl nitrogen (TKN), nitrate+nitrite (No_3+No_2), total phosphorus (TP) concentrations, and total nitrogen to phosphorus ratio by weight (TN:TP) from the epilimnion (1 m) and hypolimnion (>25 m) of Spiridon Lake, 1988-2006.

Year	Depth	Station	TKN (µg/L)	No_3+No_2 (µg/L)	TP (µg/L)	TN:TP Ratio	Mean
1988	Epilimnion	1	102.8	220.5	3.8	187	
1988	Hypolimnion	1	94.9	256.9	3.8	205	
1988	Epilimnion	2	100.5	221.3	3.5	204	
1988	Hypolimnion	2	91.4	236.2	4.0	181	195
1989	Epilimnion	1	103.4	207.1	3.6	189	
1989	Hypolimnion	1	97.9	242.8	4.2	179	
1989	Epilimnion	2	114.8	197.9	6.1	114	
1989	Hypolimnion	2	104.0	209.8	7.3	95	151
1990	Epilimnion	1	92.5	203.4	3.5	188	
1990	Hypolimnion	1	85.3	228.5	3.0	233	
1990	Epilimnion	2	83.2	185.0	2.4	245	
1990	Hypolimnion	2	87.7	187.3	2.5	244	217
1991	Epilimnion	1	93.7	234.0	4.9	148	
1991	Hypolimnion	1	87.5	265.1	5.2	150	
1991	Epilimnion	2	91.8	237.0	3.6	201	
1991	Hypolimnion	2	88.6	267.7	3.8	209	175
1992	Epilimnion	1	89.6	239.5	3.7	196	
1992	Hypolimnion	1	87.0	258.7	4.9	158	
1992	Epilimnion	2	98.4	235.2	3.6	207	
1992	Hypolimnion	2	83.2	273.4	4.5	175	201
1993	Epilimnion	1	93.6	231.6	2.7	267	
1993	Hypolimnion	1	90.7	240.2	3.0	248	
1993	Epilimnion	2	97.0	230.3	2.9	253	
1993	Hypolimnion	2	85.4	247.7	2.5	293	260
1994	Epilimnion	1	101.8	204.3	3.2	212	
1994	Hypolimnion	1	97.5	218.1	3.9	178	
1994	Epilimnion	2	105.7	202.1	2.8	245	
1994	Hypolimnion	2	105.6	225.7	3.3	219	228
1995	Epilimnion	1	108.8	203.1	3.4	203	
1995	Hypolimnion	1	105.6	241.6	3.4	225	
1995	Epilimnion	2	125.2	213.4	3.9	194	
1995	Hypolimnion	2	108.2	243.1	3.2	244	199

-continued-

Table 2.-Page 2 of 2.

Year	Depth	Station	TKN (µg/L)	No_3+No_2 (µg/L)	TP (µg/L)	TN:TP Ratio	Mean
1996	Epilimnion	1	113.4	183.6	2.7	242	
1996	Hypolimnion	1	90.5	210.8	3.0	222	
1996	Epilimnion	2	105.5	180.2	2.7	236	
1996	Hypolimnion	2	101.1	217.9	4.4	162	239
1997	Epilimnion	1	103.6	147.4	3.0	184	
1997	Hypolimnion	1	90.5	191.0	2.8	223	
1997	Epilimnion	2	106.1	168.2	3.1	198	
1997	Hypolimnion	2	107.4	188.3	3.8	171	191
1998	Epilimnion	1	138.3	121.5	4.8	120	
1998	Hypolimnion	1	118.4	174.4	4.0	162	
1998	Epilimnion	2	124.6	148.3	3.9	155	
1998	Hypolimnion	2	122.9	171.9	4.0	163	137
1999	Epilimnion	1	93.0	188.0	4.0	155	
1999	Hypolimnion	1	92.0	211.4	3.2	213	
1999	Epilimnion	2	103.5	193.4	2.7	240	
1999	Hypolimnion	2	87.9	208.1	3.0	221	197
2000	Epilimnion	1	NA	195.5	7.0	NA	
2000	Epilimnion	2	NA	184.0	6.1	NA	
2001	Epilimnion	1	101.2	193.8	4.9	133	133
2001	Epilimnion	2	NA	189.2	6.7	NA	
2002	Epilimnion	1	96.7	136.5	3.3	156	156
2002	Epilimnion	2	NA	135.0	4.0	NA	
2003	Epilimnion	1	100.3	203.3	5.7	118	118
2003	Epilimnion	2	NA	201.3	3.5	NA	
2004	Epilimnion	1	97.6	208.1	5.2	130	130
2004	Epilimnion	2	NA	193.3	6.3	NA	
2005	Epilimnion	1	205.4	142.7	2.6	296	296
2005	Epilimnion	2	NA	NA	NA	NA	
2006	Epilimnion	1	243.2	179.1	2.0	468	468
2006	Epilimnion	2	NA	179.4	1.9		
Epilimnion mean 1988-1989:							173
Epilimnion mean 1990-2005:							192

NA – not analyzed

Table 3.-Summary of seasonal mean (including standard deviation -SD) nutrient and algal pigment concentrations by station and depth for Spiridon Lake, 1988-2006.

					Total		Filterable		Total Kjeldahl							
	Station	Depth	Total-P		Filterable-P		reactive-P		nitrogen		Ammonia		Nitrate+nitrite		Chlorophyll *a*	
Year		(m)	(µg/L)	SD	(µg/L)	SD	(µg/L)	SD	(µg/L)	SD	(µg/L)	SD	(µg/L)	SD	(µg/L)	SD
1988	1	1	3.8	1.4	3.0	1.1	2.5	1.2	102.8	11.4	9.9	2.7	220.5	26.0	0.45	0.09
	1	50	3.8	0.6	2.2	0.6	1.7	0.5	94.9	9.0	11.2	5.5	256.9	9.6	0.16	0.06
	2	1	3.5	0.1	2.0	0.6	1.8	0.3	100.5	11.3	7.8	6.6	221.3	11.1	0.40	0.10
	2	50	4.0	0.6	1.9	0.6	1.8	0.5	91.4	9.9	8.6	4.4	236.2	27.5	0.29	0.12
1989	1	1	3.6	0.7	3.7	1.9	3.0	2.2	103.4	7.6	8.5	2.5	207.1	35.4	0.19	0.11
	1	50	4.2	1.0	3.2	1.2	2.4	0.4	97.9	18.6	11.5	7.3	242.8	54.9	0.32	0.18
	2	1	6.1	3.7	2.7	1.0	2.5	0.4	114.8	45.7	9.5	5.2	197.9	61.9	0.18	0.13
	2	50	7.3	7.8	2.7	0.7	2.7	0.7	104.0	40.1	12.5	11.0	209.8	50.4	0.37	0.28
1990	1	1	3.5	1.8	2.4	0.6	2.0	0.8	92.5	16.5	4.9	2.0	203.4	36.8	0.23	0.11
	1	50	3.0	0.7	2.8	0.5	2.0	0.6	85.3	10.9	6.3	2.5	228.5	24.8	0.34	0.21
	2	1	2.4	0.6	4.1	3.2	3.3	2.4	83.2	6.4	4.7	1.7	185.0	79.4	0.24	0.09
	2	50	2.5	0.8	2.8	1.1	2.9	1.9	87.7	12.3	6.6	2.8	187.3	80.1	0.24	0.12
1991	1	1	4.9	5.9	2.8	0.8	2.6	0.9	93.7	7.3	7.6	4.4	234.0	38.1	0.38	0.14
	1	50	5.2	3.7	3.3	2.0	2.8	1.4	87.5	12.9	9.4	4.8	265.1	20.9	0.20	0.09
	2	1	3.6	0.8	4.8	3.3	4.6	3.3	91.8	8.6	8.2	4.5	237.0	29.6	0.35	0.12
	2	50	3.8	1.5	3.6	3.3	3.4	3.2	88.6	7.4	11.3	5.8	267.7	7.7	0.25	0.14
1992	1	1	3.7	0.6	2.1	0.7	1.5	0.5	89.6	10.1	1.5	0.8	239.5	12.3	0.27	0.15
	1	50	4.9	1.4	4.2	3.1	3.7	3.0	87.0	8.0	4.6	3.3	258.7	16.9	0.22	0.07
	2	1	3.6	0.3	2.6	1.4	2.4	1.4	98.4	18.2	1.7	0.6	235.2	25.9	0.27	0.21
	2	50	4.5	0.8	3.1	2.8	2.0	1.1	83.2	24.8	5.3	3.7	273.4	7.7	0.23	0.11
1993	1	1	2.7	0.9	2.2	1.1	1.6	0.8	93.6	11.2	2.4	1.5	231.6	37.6	0.75	0.24
	1	50	3.0	0.9	3.0	4.0	1.8	1.8	90.7	10.8	5.2	3.4	240.2	22.8	0.42	0.20
	2	1	2.9	1.0	3.2	3.5	2.6	3.3	97.0	12.0	1.8	0.5	230.3	41.5	0.77	0.29
	2	50	2.5	0.1	3.2	2.5	2.8	2.5	85.4	3.8	5.4	3.7	247.7	30.6	0.40	0.22
1994	1	1	3.2	1.3	1.9	1.5	1.5	1.1	101.8	3.9	3.2	4.7	204.3	22.1	0.26	0.21
	1	50	3.9	2.0	1.2	0.2	1.1	0.4	97.5	16.1	6.7	3.6	218.1	18.3	0.21	0.13
	2	1	2.8	0.7	2.2	1.5	1.4	0.9	105.7	12.8	1.6	1.3	202.1	17.2	0.31	0.15
	2	50	3.3	1.2	2.2	1.3	1.9	1.1	105.6	13.2	5.8	2.5	225.7	20.6	0.20	0.07
1995	1	1	3.4	2.2	0.9	0.1	0.9	0.2	108.8	12.3	2.2	1.6	203.1	26.8	0.95	0.49
	1	50	3.4	1.3	1.5	0.3	1.4	0.4	105.6	20.4	3.5	2.4	241.6	6.6	0.58	0.44
	2	1	3.9	2.0	1.2	0.4	1.1	0.2	125.2	24.1	2.2	1.0	213.4	19.8	1.02	0.41
	2	50	3.2	0.9	0.9	0.2	0.9	0.1	108.2	18.6	4.5	3.0	243.1	9.1	0.58	0.45

-continued-

Table 3.-Page 2 of 2.

Year	Station	Depth (m)	Total-P (µg/L)	SD	Total Filterable-P (µg/L)	SD	Filterable reactive-P (µg/L)	SD	Total Kjeldahl nitrogen (µg/L)	SD	Ammonia (µg/L)	SD	Nitrate+nitrite (µg/L)	SD	Chlorophyll *a* (µg/L)	SD
1996	1	1	2.7	0.6	1.5	0.9	1.0	0.5	113.4	34.1	5.1	2.8	183.6	18.5	0.49	0.16
	1	50	3.0	1.1	1.3	0.7	1.0	0.4	90.5	18.5	9.3	5.0	210.8	9.0	0.51	0.23
	2	1	2.7	0.7	1.4	0.7	1.1	0.3	105.5	20.7	5.6	1.6	180.2	14.4	0.47	0.14
	2	50	4.4	1.7	1.5	0.7	1.5	1.3	101.1	16.9	10.2	4.1	217.9	2.4	0.57	0.33
1997	1	1	3.0	0.6	3.4	3.5	3.5	4.1	103.6	12.0	11.2	5.8	147.4	31.1	0.57	0.35
	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.58	0.37
	1	50	2.8	0.7	1.8	0.4	1.8	0.5	90.5	5.2	11.1	6.3	191.0	19.7	0.38	0.22
	2	1	3.1	0.9	3.2	3.3	3.1	3.2	106.1	11.3	11.2	6.4	168.2	25.2	0.59	0.35
	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.57	0.32
	2	50	3.8	1.5	3.1	1.0	3.2	1.0	107.4	30.3	10.7	6.2	188.3	17.5	0.44	0.24
1998	1	1	4.8	1.6	2.7	1.8	1.7	1.0	138.3	20.5	8.4	6.1	121.5	24.7	0.43	0.25
	1	50	4.0	0.4	1.6	0.8	1.3	0.5	118.4	10.1	10.2	5.4	174.4	19.6	0.14	0.04
	2	1	3.9	1.2	1.5	1.1	1.4	0.6	124.6	10.1	4.9	1.4	148.3	12.2	0.38	0.28
	2	50	4.0	1.7	1.5	0.9	1.5	0.7	122.9	12.0	9.6	4.5	171.9	26.4	0.21	0.12
1999	1	1	4.0	2.5	1.9	0.5	1.5	0.5	93.0	4.8	6.4	2.9	188.0	33.8	0.49	0.30
	1	50	3.2	0.4	1.7	0.7	1.2	0.5	92.0	2.7	6.9	3.8	211.4	6.1	0.15	0.05
	2	1	2.7	0.3	2.3	0.7	1.7	0.4	103.5	14.3	6.2	4.1	193.4	24.0	0.30	0.22
	2	50	3.0	0.6	2.3	1.6	1.7	1.4	87.9	15.3	11.2	6.0	208.1	10.1	0.25	0.14
2000	1	1	7.0	4.5	3.4	3.8	2.3	2.2	NA	NA	8.7	8.6	195.5	1.8	0.58	0.14
	2	1	6.1	8.7	3.3	4.6	2.0	2.0	NA	NA	7.5	8.0	184.0	15.7	0.77	0.18
2001	1	1	4.9	3.3	3.5	2.1	1.9	2.0	101.2	8.0	4.6	4.7	193.8	6.7	0.60	0.30
	2	1	6.7	5.1	3.5	3.3	2.7	3.5	NA	NA	2.1	1.3	189.2	7.3	0.60	0.10
2002	1	1	3.3	2.6	1.5	0.9	3.0	1.9	96.7	14.5	5.0	2.3	136.5	7.9	0.32	0.00
	2	1	4.0	1.9	1.3	1.3	1.9	1.0	NA	NA	3.4	1.7	135.0	21.2	0.45	0.18
2003	1	1	5.7	0.8	2.8	3.4	2.6	1.7	100.3	10.1	2.6	2.1	203.3	36.7	0.70	0.40
	2	1	3.5	0.7	1.4	1.1	3.6	0.8	NA	NA	1.9	2.0	201.3	22.1	0.60	0.30
2004	1	1	5.2	3.9	0.9	1.0	1.4	0.8	97.6	22.2	5.7	1.8	208.1	18.8	0.70	0.27
	2	1	6.3	5.3	3.2	5.1	2.1	0.4	NA	NA	6.8	1.2	193.3	23.4	0.70	0.29
2005	1	1	2.6	1.1	2.2	1.8	NA	NA	205.4	141.2	4.3	1.5	142.7	27.5	0.52	0.18
	2	1	NA	NA	1.1	1.2	NA	NA	NA	NA	NA	NA	NA	NA	0.68	0.06
2006	1	1	2.0	1.6	1.6	0.1	0.9	0.6	243.2	103.2	7.1	1.7	179.1	15.4	0.70	0.27
	2	1	1.9	1.6	1.5	0.3	0.8	0.3	NA	NA	7.1	1.9	179.4	21.7	0.79	0.29
Mean 1 m 1988-1989:			4.3	1.5	2.8	1.1	2.4	1.0	105.4	19.0	8.9	4.2	211.7	33.6	0.31	0.11
Mean 1 m 1990-2005:			4.0	2.1	2.4	1.9	2.1	1.4	106.8	18.7	4.9	2.9	191.4	24.5	0.52	0.22

SD - standard deviation; NA - not analyzed

Table 4.-Summary of the Spiridon Lake weighted mean density and biomass of cladocerans and copepods and their density ratio, 1988-2006.

	Cladoceran		Copepod		Total		Cladoceran to Copepod ratio[a]	
	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
Year	No./m^3	mg/m^3	No./m^3	mg/m^3	No./m^3	mg/m^3	No./m^3	mg/m^3
1988	1,120	5.3	4,006	11.7	5,126	17.0	0.28	0.45
1989	1,308	4.9	9,826	15.8	11,134	20.7	0.13	0.31
1990	1,055	5.1	6,361	17.7	7,416	22.8	0.17	0.29
1991	834	3.4	8,862	18.8	9,696	22.2	0.09	0.18
1992	980	4.5	6,996	21.7	7,976	26.2	0.14	0.21
1993	878	2.9	5,616	10.3	6,494	13.2	0.16	0.29
1994	1,517	4.7	4,977	10.0	6,494	14.7	0.30	0.47
1995	1,589	6.4	4,538	12.0	6,127	18.4	0.35	0.53
1996	1,180	5.2	7,762	17.1	8,942	22.3	0.15	0.30
1997	1,531	6.7	2,477	6.3	4,008	13.0	0.62	1.06
1998	1,715	6.8	7,262	10.5	8,977	17.3	0.24	0.65
1999	726	2.6	1,450	3.5	2,176	6.1	0.50	0.74
2000 [b]	1,580	5.0	7,393	9.6	8,973	14.6	0.21	0.52
2001 [b]	1,752	7.6	1,421	4.4	3,173	11.9	1.23	1.73
2002 [b]	2,211	11.3	4,964	9.8	7,175	21.1	0.45	1.16
2003 [b]	2,785	6.8	3,779	6.7	6,564	13.4	0.74	1.01
2004 [b]	1,679	3.6	1,510	2.9	3,189	6.5	1.11	1.22
2005 [b]	3,329	10.2	1,635	2.7	4,964	12.8	2.04	3.77
2006	1,416	4.2	369	1.0	1,785	5.2	3.84	4.20
mean 88-89:	1,214	5.1	6,916	13.8	8,130	18.9	0.18	0.37
mean 90-05:	1,584	5.8	4,813	10.2	6,397	16.0	0.33	0.57

[a] Values based on mean density.

[b] Values include the Copepod *Epischura*.

Table 5.-Spiridon Lake weighted mean copepod density and biomass by species and the *Diaptomus* to *Cyclops* density ratio, 1988-2006.

Year	Number of Samples	*Epischura* Density No./m^3	*Epischura* Biomass mg/m^3	*Diaptomus* Density No./m^3	*Diaptomus* Biomass mg/m^3	*Cyclops* Density No./m^3	*Cyclops* Biomass mg/m^3	Totals Density No./m^3	Totals Biomass mg/m^3	*Diaptomus to Cyclops* density ratio[a]
1988	4	0	0.0	1,067	4.9	2,939	6.8	4,006	11.7	0.36
1989	5	0	0.0	2,199	6.7	7,627	9.1	9,826	15.8	0.29
1990	5	0	0.0	2,228	9.4	4,134	8.3	6,361	17.7	0.54
1991	7	0	0.0	2,276	7.5	6,587	11.3	8,862	18.8	0.35
1992	6	0	0.0	504	3.1	6,492	18.6	6,996	21.7	0.08
1993	6	5	0.0	221	1.1	5,395	9.2	5,621	10.3	0.04
1994	6	0	0.0	155	0.8	4,822	9.2	4,977	10.0	0.03
1995	6	0	0.0	266	2.5	4,272	9.5	4,538	12.0	0.06
1996	6	0	0.0	69	0.4	7,693	16.7	7,762	17.1	0.01
1997	6	0	0.0	64	0.5	2,413	5.8	2,477	6.3	0.03
1998	5	0	0.0	163	0.9	7,099	9.6	7,262	10.5	0.02
1999	5	0	0.0	97	0.5	1,353	3.0	1,450	3.5	0.07
2000	5	133	0.2	61	0.3	7,332	9.3	7,526	9.8	0.01
2001	5	46	0.1	95	0.9	1,326	3.4	1,467	4.4	0.07
2002	5	81	0.1	459	2.5	4,506	7.3	5,045	9.9	0.10
2003	4	381	0.4	593	2.6	3,186	4.1	4,160	7.1	0.19
2004	5	57	0.1	100	0.7	1,410	2.3	1,567	3.0	0.07
2005	5	36	0.0	45	0.2	1,590	2.5	1,671	2.7	0.03
2006	5	3	0.0	17	0.1	259	0.8	279	0.9	0.07
Mean 1988-1989:	5	0	0.0	1,633	5.8	5,283	8.0	6,916	13.8	0.31
Mean 1990-2005:	5	46	0.1	462	2.1	4,351	8.1	4,859	10.3	0.11

[a] Values based on mean density.

Table 6.-Summary of the Spiridon Lake weighted mean density and biomass of cladocerans by species and the *Bosmina* to *Daphnia* density ratio, 1988-2006.

		Bosmina		*Daphnia*		*Holopedium*		Totals		*Bosmina* to
	Number of	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	*Daphnia*
Year	Samples	No./m^3	mg/m^3	No./m^3	mg/m^3	No./m^3	mg/m^3	No./m^3	mg/m^3	density ratio[a]
1988	4	724	2.6	381	2.6	15	0.1	1,120	5.3	1.90
1989	5	759	2.2	441	1.9	108	0.8	1,308	4.9	1.72
1990	5	424	1.4	601	3.6	30	0.1	1,055	5.1	0.70
1991	7	144	0.4	662	2.9	28	0.1	834	3.4	0.22
1992	6	298	1.0	614	3.0	68	0.5	980	4.5	0.49
1993	6	324	0.9	479	1.4	75	0.6	878	2.9	0.68
1994	6	561	1.5	801	2.0	155	1.2	1,517	4.7	0.70
1995	6	599	1.5	591	1.6	399	3.3	1,589	6.4	1.01
1996	6	571	1.9	427	1.6	182	1.7	1,180	5.2	1.34
1997	6	652	1.8	526	2.2	353	2.7	1,531	6.7	1.24
1998	5	474	1.2	915	4.4	326	1.2	1,715	6.8	0.52
1999	5	374	1.2	216	0.7	136	0.7	726	2.6	1.73
2000	5	855	2.0	442	1.2	282	1.7	1,580	5.0	1.94
2001	5	664	1.9	793	2.5	294	3.2	1,752	7.6	0.84
2002	5	714	2.1	485	2.4	1,012	6.9	2,211	11.3	1.47
2003	4	1,671	3.2	826	1.7	288	1.9	2,785	6.8	2.02
2004	5	638	1.4	999	2.0	42	0.2	1,679	3.6	0.64
2005	5	1,745	4.1	1,122	1.9	462	4.2	3,329	10.2	1.56
2006	5	516	1.1	559	0.9	378	3.1	1,453	5.1	0.92
Mean 1988-1989:	5	741	2.4	411	2.3	62	0.5	1,214	5.1	1.80
Mean 1990-2005:	5	669	1.7	656	2.2	258	1.9	1,584	5.8	1.07

[a] Values based on mean density.

Table 7.-Seasonal weighted mean lengths (mm) of zooplankton taxa in Spiridon Lake, 1988-2006.

Year	*Diaptomus*	*Cyclops*	*Bosmina*	*Daphnia*	*Holopedium*
1988	1.02	0.81	0.61	1.20	0.73
1989	0.89	0.60	0.56	0.96	0.82
1990	0.99	0.76	0.59	1.10	0.69
1991	0.94	0.70	0.55	0.99	0.76
1992	1.13	0.91	0.60	1.01	0.91
1993	1.06	0.70	0.51	0.80	0.83
1994	1.09	0.75	0.55	0.75	0.85
1995	1.30	0.79	0.51	0.78	0.83
1996	0.99	0.78	0.58	0.92	0.91
1997	1.26	0.82	0.54	1.00	0.84
1998	1.09	0.63	0.52	0.90	0.58
1999	1.06	0.78	0.58	0.92	0.63
2000	1.14	0.61	0.51	0.79	0.76
2001	1.34	0.85	0.55	0.84	0.97
2002	1.12	0.69	0.55	1.01	0.80
2003	1.00	0.62	0.45	0.68	0.80
2004	1.14	0.70	0.50	0.72	0.68
2005	1.00	0.67	0.50	0.62	0.79
2006	1.10	0.93	0.47	0.60	0.86
Mean 1988-1989:	0.95	0.71	0.58	1.08	0.77
Mean 1990-2005:	1.11	0.73	0.53	0.85	0.79

Table 8.-Sockeye salmon stocking numbers, life stage, size and release date by year into Spiridon Lake, 1990-2006.

	Fry[a]		Fingerling[a]		Pre-Smolt[a]	Total Stocked
1990	249,346					249,346
Date/Size	na/na					
1991	3,480,000					3,480,000
Date/Size	7-Jul/ .25 g					
1992	2,200,000					2,200,000
Date/Size	20-Jun/ .20 g					
1993	4,246,000					4,246,000
Date/Size	9-Jun/ .20 g					
1994	4,400,000	1,276,000				5,676,000
Date/Size	24-May/ .20 g	9-Jun/ .20 g				
1995	2,813,000		1,786,000			4,599,000
Date/Size	26-Jun/ .30 g		5-Jul/ .40 g			
1996	1,100,000		3,744,000			4,844,000
Date/Size	21-May/ .20 g		26-Jun/ .35 g			
1997	4,200,000	1,300,000	1,200,000			6,700,000
Date/Size	28-Jun/ .23 g	12-Jul/ .31 g	24-Jul/ .52 g			
1998	784,000		2,556,000			3,340,000
Date/Size	18-Jun/ .35 g		13-Jul/ .90 g			
1999	600,000		2,160,000	804,000		3,564,000
Date/Size	18-Jun/ .33 g		8-29 Jul/ 1.0 g	2-17 Jul/ 2.0 g		
2000	535,000	3,355,000	507,100			4,397,100
Date/Size	25-May/ .30 g	11-Jun/ .40 g	23-Aug/ 3.0 g			
2001			1,700,600			1,700,600
Date/Size			21-Jun/ .80 g			
2002			366,000		586,900	952,900
Date/Size			30-Jul/ 1.2 g		4-Oct/ 8.5 g	
2003			730,744		686,775	1,417,519
Date/Size			29-Jun/ 1.2 g		9-Oct/ 11.8 g	
2004			2,008,205	288,219	501,220	2,797,644
Date/Size			19-Jun/ .50 g	16-Aug/ 4.1 g	5-7 Oct/ 11.5 g	
2005			693,176		508,492	1,201,668
Date/Size			23-Jun/ .75 g		2-3 Oct/ 8.4 g	
2006	2,765,088				431,424	3,196,512
Date/Size	23-24 Jun/ .37 g				5-6 Oct/ 9.9 g	
mean 1991-2005:						3,407,762

[a] Release dates typically spanned several days due to the large number of juveniles to be released and weather delays. Therefore, weights were averaged for multiple release dates.

Table 9.-Spiridon Lake sockeye salmon total and live smolt estimates by year and age, 1992-2006.

Smolt Outmigration Year	Number and Relative Proportions of Smolt by Age Class 1.	2.	3.	Total Smolt	Total Mortality	Number and Relative Proportions of Live Smolt by Age Class 1.	2.	3.	Total Live Smolt
1992	1,466,995	17,826	0	1,484,821	87,169	1,380,321	17,331	0	1,397,652
	98.8%	1.2%	0.0%	100.0%	5.9%	98.8%	1.2%	0.0%	100.0%
1993	260,115	85,443	0	345,558	15,433	249,784	80,341	0	330,125
	75.3%	24.7%	0.0%	100.0%	4.5%	75.7%	24.3%	0.0%	100.0%
1994	599,717	244,360	6,271	850,348	3,123	597,502	243,464	6,259	847,225
	70.5%	28.7%	0.7%	100.0%	0.4%	70.5%	28.7%	0.7%	100.0%
1995	314,604	299,556	831	614,992	21,030	304,326	288,822	813	593,961
	51.2%	48.7%	0.1%	100.0%	3.4%	51.2%	48.6%	0.1%	100.0%
1996	918,540	135,414	1,232	1,055,186	23,120	897,762	133,097	1,207	1,032,066
	87.1%	12.8%	0.1%	100.0%	2.2%	87.0%	12.9%	0.1%	100.0%
1997	654,293	237,492	2,934	894,719	25,551	635,650	230,685	2,833	869,168
	73.1%	26.5%	0.3%	100.0%	2.9%	73.1%	26.5%	0.3%	100.0%
1998	529,726	216,923	301	746,950	21,321	514,606	210,731	292	725,629
	70.9%	29.0%	0.0%	100.0%	2.9%	70.9%	29.0%	0.0%	100.0%
1999	812,267	123,458	373	936,118	37,331	779,875	118,534	358	898,787
	86.8%	13.2%	0.0%	100.0%	4.0%	86.8%	13.2%	0.0%	100.0%
2000	792,029	493,529	5,133	1,290,692	4,384	788,909	492,275	5,122	1,286,306
	61.4%	38.2%	0.4%	100.0%	0.3%	61.3%	38.3%	0.4%	100.0%
2001	1,093,246	442,975	0	1,536,221	7,305	1,087,695	441,221	0	1,528,916
	71.2%	28.8%	0.0%	100.0%	0.5%	71.1%	28.9%	0.0%	100.0%
2002	441,964	92,484	0	534,448	12,523	431,542	90,384	0	521,925
	82.7%	17.3%	0.0%	100.0%	2.3%	82.7%	17.3%	0.0%	100.0%

-continued-

Table 9.-Page 2 of 2.

Smolt Year	Number and Proportions of Smolt by Age Class 1.	2.	3.	Total Smolt	Total Mortality	Number and Proportions of Live Smolt by Age Class 1.	2.	3.	Total Live Smolt
2003	228,857	34,854	914	264,624	1,777	227,363	34,696	789	262,847
	86.5%	13.2%	0.3%	100.0%	0.7%	86.5%	13.2%	0.3%	100.0%
2004	540,748	36,882	1,274	578,904	1,249	539,582	36,804	1,269	577,655
	93.4%	6.4%	0.2%	100.0%	0.2%	93.4%	6.4%	0.2%	100.0%
2005	1,368,763	48,326	4,264	1,421,353	11,979	1,357,702	47,636	4,036	1,409,374
	96.3%	3.4%	0.3%	100.0%	0.8%	96.3%	3.4%	0.3%	100.0%
2006	471,241	94,932	0	566,173	1,214	470,231	94,728	0	564,959
	83.2%	16.8%	0.0%	100.0%	0.2%	83.2%	16.8%	0.0%	100.0%
Average	715,847	179,252	1,680	896,781	19,521	699,473	176,144	1,641	877,260
1992-05	79.8%	20.0%	0.2%	100.0%	2.2%	79.7%	20.1%	0.2%	100.0%

Table 10.-Mean length, weight, and condition coefficient by age of sockeye salmon smolt emigrating from Spiridon Lake, 1991-2006.

	Age-1.					Age-2.					Age-3.				
Year	N [a]	%	Length (mm)	Weight (g)	Condition (K)	N [a]	%	Length (mm)	Weight (g)	Condition (K)	N [a]	%	Length (mm)	Weight (g)	Condition (K)
1991	596	100.0	127	19.3	1.08	0	0.0				0	0.0			
1992	1393/1389	98.8	115	12.7	0.81	16/14	1.1	183	58.9	0.80	0	0.0			
1993	817/493	66.8	116	13.4	0.83	404/240	33.0	155	33.8	0.88	2/2	0.2	178	50.7	0.90
1994	1477/929	73.5	106	9.3	0.78	526/344	26.2	152	28.5	0.79	6/4	0.3	254	145.8	0.88
1995	1697/999	60.9	104	9.2	0.81	1081/667	38.8	138	25.1	0.95	6/5	0.2	244	102.8	0.84
1996	2224/1573	76.1	109	10.3	0.79	694/513	23.7	141	20.7	0.73	6/5	0.2	221	85.6	0.77
1997	1428/876	66.2	102	8.6	0.80	720/441	33.4	137	20.6	0.80	11/6	0.5	169	41.9	0.81
1998	2205/1496	77.4	93	6.3	0.76	727/414	22.5	127	15.4	0.75	3/0	0.1			
1999 [b]	1452/799	73.6	95	7.0	0.80	518/336	26.3	122	14.1	0.78	2/1	0.1	126	15.0	0.75
2000	2263/1700	81.1	94	6.8	0.79	507/325	18.2	132	18.5	0.8	22/8	0.8	142	22.4	0.77
2001	2037/2037	80.1	104	8.8	0.78	506/506	19.9	136	20.2	0.79	0/0	0.0			
2002	1716/1716	86.6	118	12.7	0.77	266/266	13.4	155	30.2	0.80	0/0	0.0			
2003	1226/1197	80.0	131	20.4	0.89	288/277	18.8	165	42.4	0.87	19/19	1.2	168	42.7	0.84
2004	1325	89.0	127	16.8	0.80	160	10.7	184	51.3	0.80	3	0.2	227	97.7	0.84
2005	1068	88.6	106	9.6	0.79	119	9.9	178	51.1	0.83	18	1.5	195	61.8	0.84
2006	871	88.1	107	9.7	0.75	118	11.9	158	32.6	0.82	0	0	0	0.0	0.00
Average 1991-2005			110	11.4	0.82			150	30.8	0.81			192	66.6	0.82

[a] The first 'n' is the number of aged smolt / the second 'n' is the number of smolt sampled for length, weight, and condition.

[b] One smolt sampled was age 0. and was 96 mm; 6.6 g; 0.75 K.

Table 11.-Commercial harvest by species by day in the Spiridon Bay Special Harvest Area (statistical area 254-50), 2006.

Date	Sockeye	Coho	Pink	Chum
28-Jun	6,307	0	98	13
29-Jun	473	0	29	8
30-Jun	292	0	27	5
1-Jul	783	0	109	288
2-Jul	340	0	35	1
3-Jul	793	0	104	23
4-Jul	355	0	50	3
5-Jul	670	0	139	11
6-Jul	4,338	0	160	9
7-Jul	207	0	60	9
8-Jul	448	0	50	18
9-Jul	403	0	105	8
10-Jul	1,120	0	355	7
11-Jul	1,502	0	793	42
12-Jul	955	0	0	60
13-Jul	1,823	0	775	147
14-Jul	459	0	925	56
15-Jul	218	0	306	15
16-Jul	2,416	0	155	61
17-Jul	0	0	0	0
18-Jul	0	0	0	0
19-Jul	335	0	765	54
20-Jul	0	0	0	0
21-Jul	0	0	0	0
22-Jul	331	0	0	0
23-Jul	0	0	0	0
24-Jul	0	0	0	0
25-Jul	66	0	506	12
26-Jul	309	0	345	6
27-Jul	1,659	0	0	0
28-Jul	2,790	0	3,625	168
29-Jul	3,587	0	6,054	40
30-Jul	0	0	0	0
31-Jul	128	0	3,275	19
1-Aug	0	0	0	0
2-Aug	1,240	0	0	0
3-Aug	0	0	0	0
4-Aug	0	0	0	0
5-Aug	1,736	0	0	0
6-Aug	0	0	0	0
7-Aug	0	0	0	0
8-Aug	0	0	0	0
9-Aug	0	0	0	0
10-Aug	0	0	0	0
11-Aug	0	0	0	0
12-Aug	384	7	10,436	16
Total:	36,467	7	29,281	1,099

Table 12.-Commercial harvest by species by year in the Spiridon Bay Special Harvest Area (statistical area 254-50), 1994-2006.

Year	Sockeye	Coho	Pink	Chum
1994	130,891	4,584	32,331	2,291
1995	11,889	2,194	46,422	2,169
1996	164,114	3,622	44,701	4,684
1997	66,480	4,889	54,236	2,575
1998	90,447	2,211	103,715	4,812
1999	192,773	2,149	61,004	13,700
2000	81,931	565	108,254	13,070
2001	59,733	345	70,883	12,885
2002	201,534	2,331	222,860	8,189
2003	259,714	66	73,549	10,643
2004	75,775	12	23,644	2,105
2005	59,494	0	33,254	2,106
2006	36,467	7	29,281	1,099
1994-2005	114,899	1,671	76,593	6,994

Table 13.-Estimated age composition of adult sockeye salmon harvest from Spiridon Bay Special Harvest Area (statistical area 254-50), 1994-2006.

Year	Sample Size		Ages % 0.2	1.1	0.3	1.2	2.1	1.3	0.4	2.2	2.3	3.1	3.2	1.4	2.4	Total[a]
1994	1,329	Percent	0.0	0.1	0.0	99.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
		Numbers	0	149	0	114,624	356	30	0	21	9	0	0	0	0	115,189
1995	1,313	Percent	0.1	19.9	0.1	60.2	1.9	4.9	0.0	11.6	1.3	0.0	0.0	0.0	0.0	100.0
		Numbers	19	6,312	37	19,089	595	1,563	0	3,667	409	0	0	0	0	31,691
1996	1,875	Percent	0.0	1.8	0.0	79.0	4.6	0.2	0.0	14.3	0.0	0.1	0.0	0.0	0.0	100.0
		Numbers	0	2,846	0	128,123	7,448	303	0	23,192	0	111	97	0	0	162,120
1997	1,703	Percent	0.0	2.8	0.0	62.6	2.8	2.4		29.3	0.0	0.0	0.0	0.0	0.0	99.9
		Numbers	0	1,795	0	40,359	1,824	1,558	0.0	18,908	25	7	7	0	0	64,483
1998	1,943	Percent	0.0	4.2	0.0	81.8	2.0	0.6	0.0	10.7	0.5	0.0	0.1	0.0	0.0	99.9
		Numbers	0	3,726	0	72,354	1,785	543	0	9,448	485	0	111	0	0	88,452
1999	2,345	Percent	0.0	0.4	0.0	47.8	0.2	32.7	0.0	17.4	1.5	0.0	0.1	0.0	0.0	100.1
		Numbers	0	689	86	91,129	298	62,405	0	33,167	2,836	0	168	0	0	190,778
2000	1,997	Percent	0.0	0.1	0.1	71.5	0.2	3.0	0.0	18.3	6.6	0.0	0.1	0.1	0.0	100.0
		Numbers	9	122	60	58,559	176	2,419	0	14,987	5,446	0	110	42	0	81,930
2001	1,534	Percent	0.0	1.1	0.1	58.5	3.4	17.2	0.0	19.0	0.7	0.0	0.0	0.0	0.0	100.0
		Numbers	0	674	51	34,921	2,022	10,300	28	11,334	391	0	0	7	7	59,735
2002	1,572	Percent	0.0	0.2	0.0	36.1	2.0	35.8	0.0	24.7	1.0	0.0	0.1	0.1	0.0	100.0
		Numbers	0	466	59	71,962	4,077	71,479	0	49,330	1,909	0	119	139	0	199,539
2003	1,782	Percent	0.0	0.3	0.0	46.3	0.0	26.9	0.0	21.2	5.1	0.0	0.0	0.1	0.0	100.0
		Numbers	0	849	0	120,346	68	69,908	0	55,122	13,201	0	68	151	0	259,714
2004	1,761	Percent	0.0	0.1	0.0	27.8	0.0	54.6	0.0	7.8	9.4	0.0	0.0	0.2	0.0	100.0
		Numbers	0	101	29	21,029	22	41,349	0	5,880	7,156	0	29	160	0	75,775
2005	1,272	Percent	0.0	7.5	0.0	38.3	0.0	52.2	0.0	1.5	0.3	0.0	0.0	0.0	0.0	100.0
		Numbers	0	4,475	0	22,812	25	31,081	0	909	193	0	0	0	0	59,494
2006	999	Percent	0.0	0.4	0.0	83.0	0.4	11.9	0.0	3.0	0.3	0.0	0.0	1.0	0.0	100.0
		Numbers	0	157	0	30,277	141	4,354	0	1,082	92	0	0	363	0	36,467
1994-2005	1,755	Percent	0.0	1.6	0.0	57.3	1.3	21.1	0.0	16.3	2.3	0.0	0.1	0.0	0.0	100.0
Average		Numbers	2	1,850	27	66,276	1,558	24,411	2	18,830	2,672	10	59	42	1	115,740

[a] Totals may not add exactly due to rounding.

Table 14.-Indexed peak salmon escapements by species at Telrod Creek (254-403), 1995-2006.

Year	Date	Sockeye[a]	Pink[a]
1995	15-Aug	120	233
1996	15-Sep	10	238
1997	11-Sep		350
	9-Oct	3,000	
1998	17-Aug	5,013	327
1999	31-Aug	1,220	
	10-Sep		60
2000	4-Sep	1,321	353
2001	18-Aug	1,600	450
2002	13-Aug		1,710
	17-Aug	1,880	
2003	14-Aug	5,252	450
2004	3-Aug	1,200	0
2005	11-Jul	500	100
2006[b]	30-Jul	500	0

[a] Survey estimates include salmon in stream mouth.

[b] The 30 July survey was an estimate of salmon in the plunge pool at the first waterfall barrier and does not represent a survey of the entire stream to the barrier.

Table 15.-Indexed peak salmon escapements by species for the Spiridon River (254-401), 1995-2006.

Year	Date	Observer	Survey Conditions	Survey counts [a] pink	chum	coho
1995	17-Aug	ADF&G	good	87,800	22,000	
	13-Oct	FWS	good			10,300
1996	29-Aug	FWS	good	5,700	8,000	
	16-Oct	FWS	excellent			10,600
1997	1-Aug	ADF&G	good	18,100	5,500	
	9-Oct	ADF&G	excellent			13,300
1998	14-Aug	ADF&G	fair	29,500	6,150	
	14-Sep	FWS	good			1,750
1999	11-Aug	ADF&G	fair		15,000	
	27-Aug	ADF&G	fair	15,500		
2000	21-Aug	FWS	fair	1,000	16,500	
	20-Oct	FWS	good			2,900
2001	1-Aug	ADF&G	poor		3,000	
	7-Aug	ADF&G	fair	18,000		
	29-Oct	FWS	good			4,550
2002	2-Sep	ADF&G	fair to poor	32,000	6,500	
	3-Sep	ADF&G	poor		7,380	
					13,880 [b]	
2003	5-Aug	ADF&G	poor	5,000	5,700	
	5-Sep	ADF&G	poor			700
2004 [c]						
2005 [d]	8-Aug	ADF&G	poor	5,000	6,400	0
	26-Aug	ADF&G	good to excellent	50	15,500	
2006	17-Aug	ADF&G	fair	14,700		
	26-Aug	ADF&G	fair		5,000	

[a] Survey counts include stream, mouth, and bay areas.

[b] The 2002 peak chum estimate was a sum of the September 2 and 3 survey estimates. ADF&G manager's sum estimates were from surveys conducted on two consecutive days in determining the indexed peak count.

[c] No surveys were conducted in 2004.

[d] The August 8 survey only included the upper river drainage.

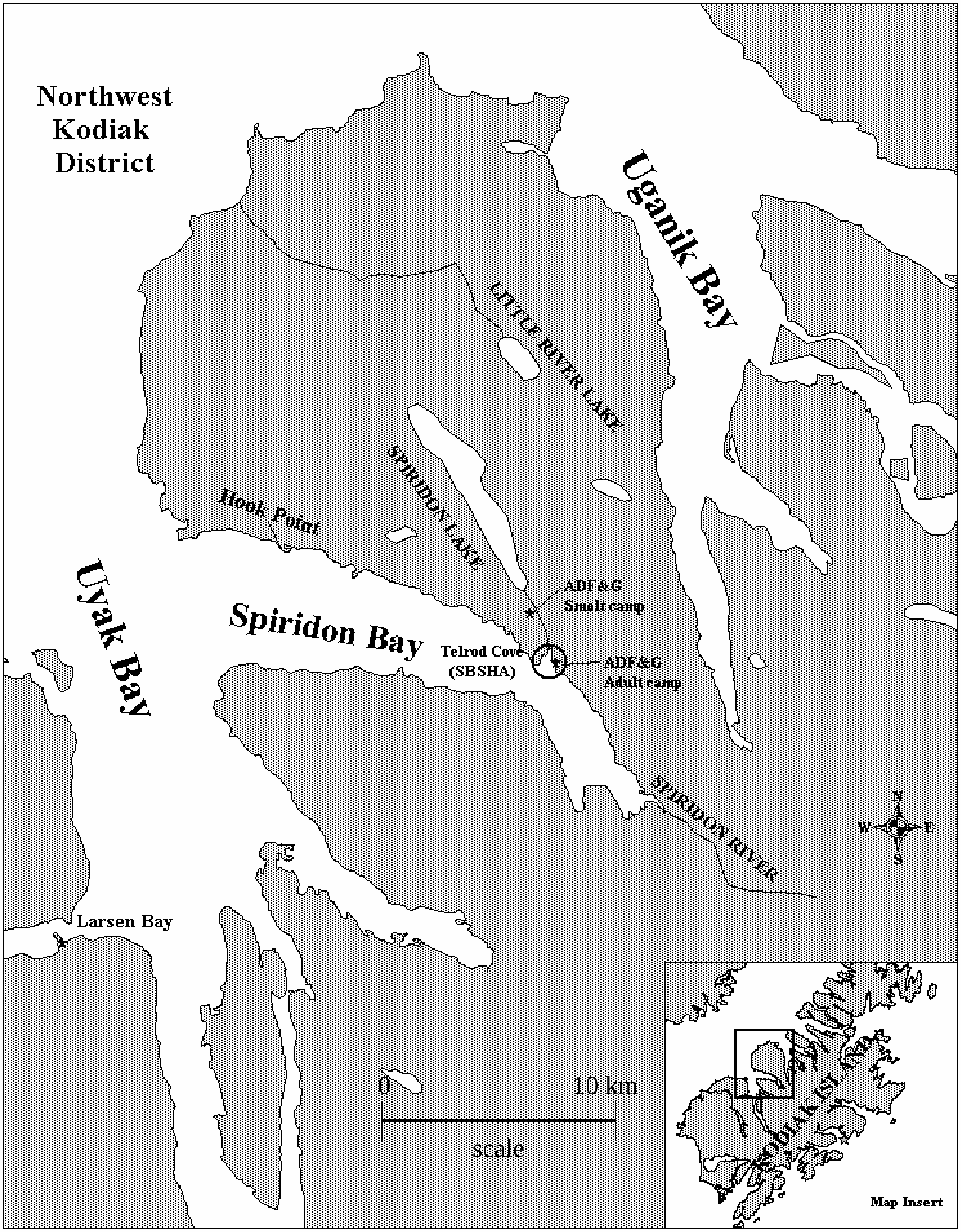

Figure 1.-Locations of the ADF&G smolt and adult salmon field camps, Spiridon Lake, Telrod Cove, and Spiridon Bay in the Northwest Kodiak Commercial Fishing District.

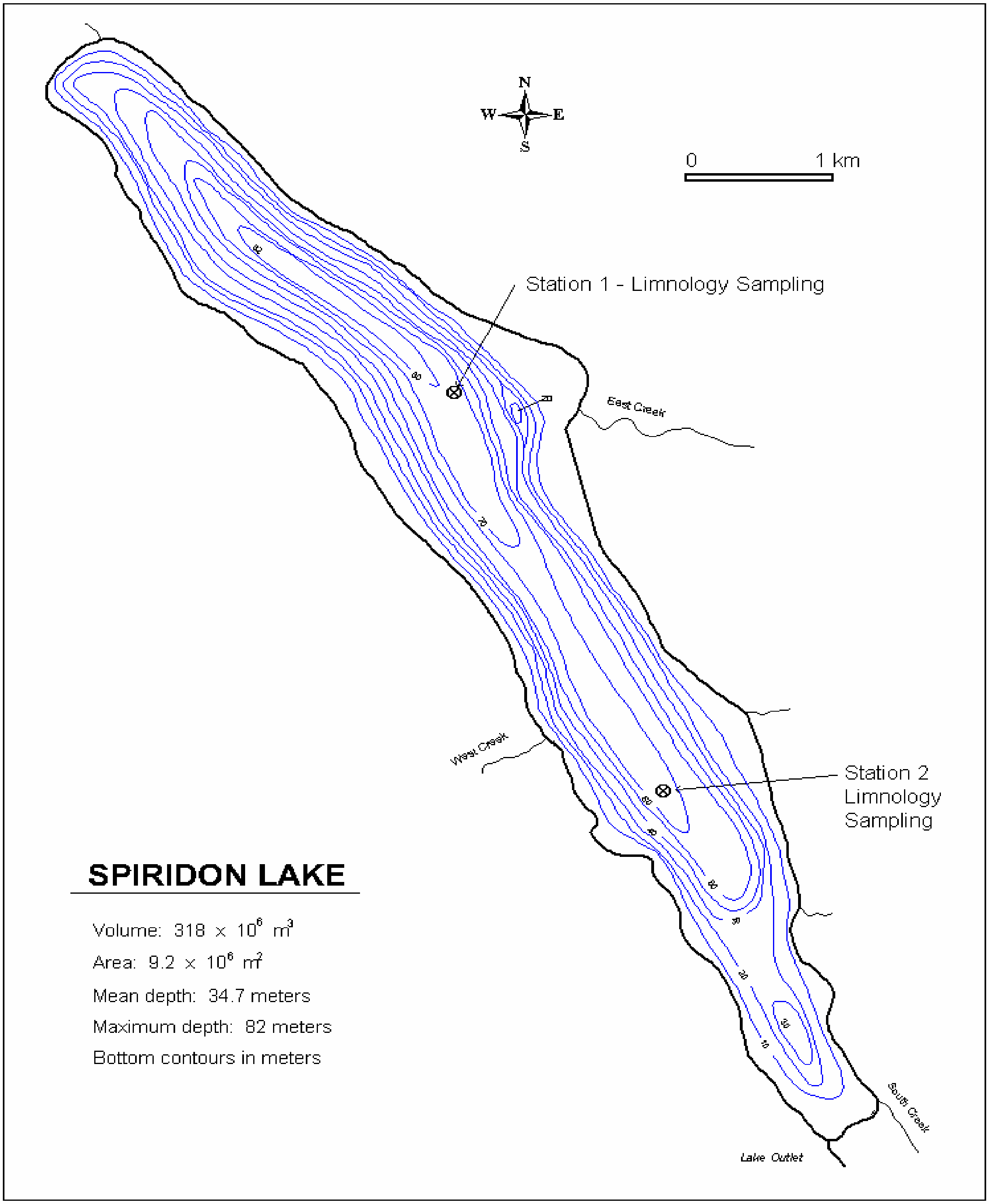

Figure 2.-Morphometric map showing the limnology sampling stations on Spiridon Lake.

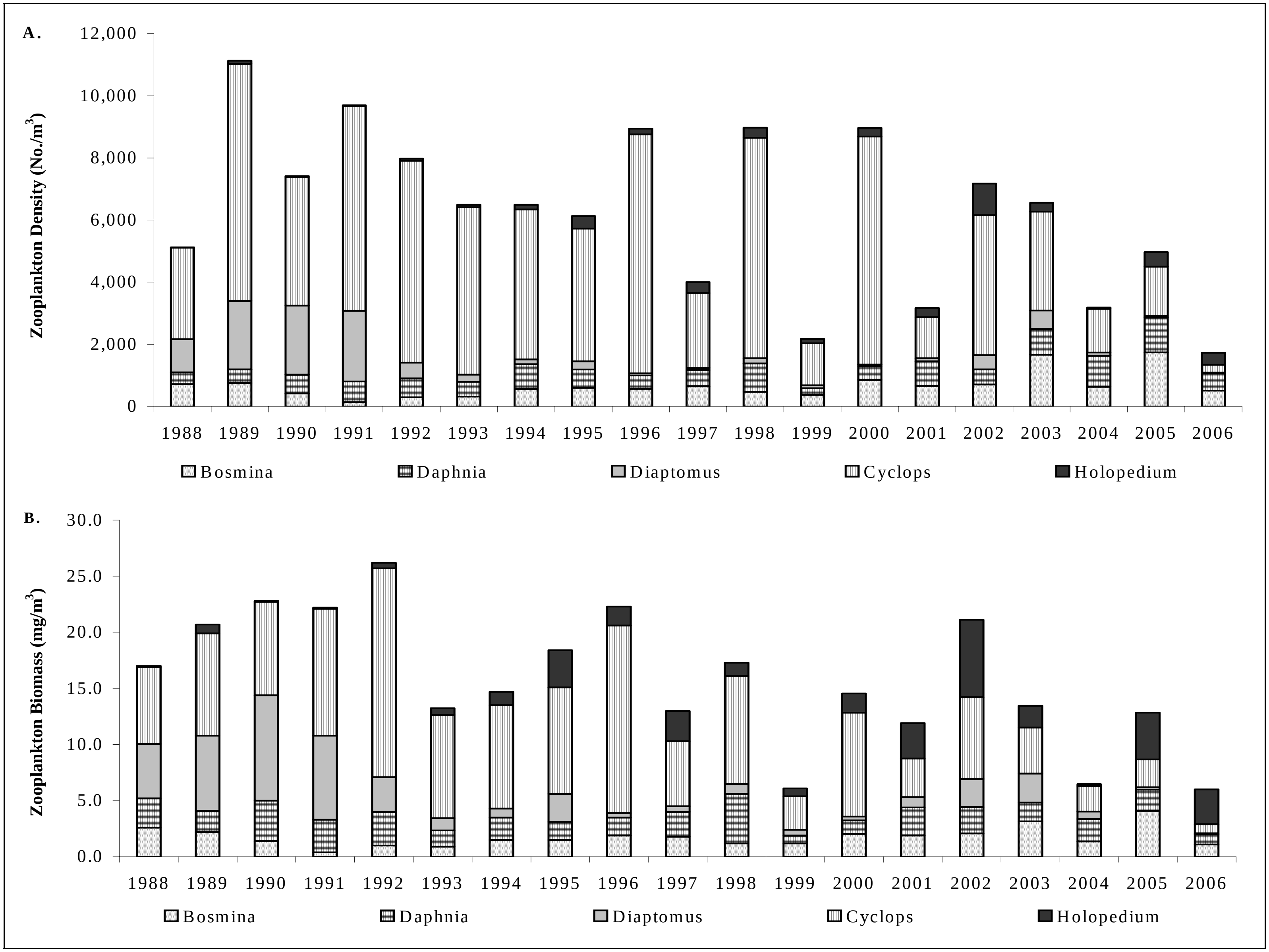

Figure 3.-Zooplankton density (A) and biomass (B) estimates for Spiridon Lake, 1988-2006.